

## CLAIMS

What is claimed is:

1. A code division multiple access user equipment for use in receiving a plurality of data signals received over a shared spectrum, each received data signal experiencing a similar channel response, the user equipment comprising:

means for receiving a combined signal of the received data signals over the shared spectrum;

means for sampling the combined signal at a multiple of a chip rate of the data signals;

means for estimating a channel response as a channel response matrix for the combined signal at the multiple of the chip rate;

means for determining a padded version of a spread data vector of a size corresponding to the multiple chip rate using a column of the channel response matrix, the estimated channel response matrix, the samples and a fourier transform; and

means for estimating the spread data vector by eliminating elements of the padded version so that the estimated spread data vector is of a size corresponding to the chip rate.

2. The user equipment of claim 1 wherein the multiple of the chip rate is an  $N$ -multiple of the chip rate and the estimated spread data vector comprises elements of the padded version spaced by  $N$  elements.

3. The user equipment of claim 2 further comprising determining an expanded version of the channel response matrix by adding  $N - 1$  columns for every column of the channel response matrix.

4. The user equipment of claim 1 wherein the fourier transform is a fast fourier transform.

5. The user equipment of claim 4 wherein the padded version determining further uses an inverse fast fourier transform.

6. A code division multiple access user equipment for use in receiving a plurality of data signals received over a shared spectrum, each received data signal experiencing a similar channel response, the user equipment comprising:

an antenna for receiving a combined signal of the received data signals over the shared spectrum;

a sampling device for sampling the combined signal at a multiple of a chip rate of the received data signals;

a channel estimation device for estimating a channel response as a channel response matrix for the combined signal at the multiple of the chip rate;

a single user detection device for determining a padded version of a spread data vector of a size corresponding to the multiple chip rate using a column of the channel response matrix, the estimated channel response matrix, the samples and a fourier transform, and for estimating the spread data vector by eliminating elements of the padded version so that the estimated spread data vector is a size corresponding to the chip rate.

7. The user equipment of claim 6 wherein the multiple of the chip rate is an  $N$ -multiple of the chip rate and the estimated spread data vector comprises elements of the padded version spaced by  $N$  elements.

8. The user equipment of claim 7 further comprising determining an expanded version of the channel response matrix by adding  $N - 1$  columns for every column of the channel response matrix.

9. The user equipment of claim 8 wherein the fourier transform is a fast fourier transform.
10. The user equipment of claim 8 wherein the padded version determining further uses an inverse fast fourier transform.